Polychlorinated Biphenyls (PCBs) in Paint Survey and Assessment of Vehicle Assembly Building Doors

Location:

Kennedy Space Center, Florida

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BEST **Project # 504-007**
RS&H Project # 302-3354-021?

May 12, 2005

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Environmental Survey Title Sheet

Facility Name:	**Vehicle Assembly Building**
Address:	**Launch Complex 39**
City:	**Kennedy Space Center, Florida**
Owner:	**National Aeronautics & Space Administration**
Date of Survey:	**April 25, 2005**
Environmental Consultant:	**Browning Environmental Service Technologies**
Address:	**3954 N. W. 41st Court**
City:	**Gainesville, Florida 32606-4557**
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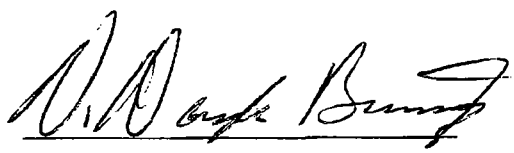

V. Douglas Browning, P.E.
EA 0000029
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1.0 INTRODUCTION

1.1 Description of Polychlorinated Biphenyls (PCBs)

PCBs are well absorbed after oral, inhalation, or dermal exposure (ATSDR 1995). Oral exposure through consumption of contaminated food (including breast milk) is the major route of exposure to PCBs for the general population. Populations living near hazardous waste sites may be orally exposed via consumption of contaminated water or soil (ATSDR 1995). Both the inhalation and dermal routes of exposure are recognized as significant contributors of PCB accumulation in occupationally exposed individuals. Quantitative data concerning inhalation exposure to PCBs are not available. PCBs aregenerally identifire as combinations of one or more of the following Aroclor compounds: 1016, 1221, 1232, 1242, 1248, 1254, and 1260.

1.1.1 Identifying Polychlorinated Biphenyls (PCBs)

The PCBs have been used many years and were primairly manufactured by the Monsanto Chemical company for use in electrical equipment as they are poor electrical conductors and good heat conductors. These additives were also used in some caulking and paints used on the metal structural components, all types of walls and trim of many buildings and equipment. All manufacture and use of PCBs was discontinued about 1977 so it typically is not found in newer structures.

1.2 Health Concerns

PCBs are inert, thermally and physically stable, and have dielectric properties. In the environment, the behavior of PCB mixtures is directly correlated to the degree of chlorination. Aroclor® is strongly sorbed to soil and remains immobile when leached with water; however, the mixture is highly mobile in the presence of organic solvents (USAF 1989). PCBs are resistant to chemical degradation by oxidation or hydrolysis. However, biodegradation, especially of lower chlorinated PCBs, can occur (USAF

1989). PCBs have high bioconcentration factors, and due to lipophilicity, especially of highly chlorinated congeners, tend to accumulate in the fat of fish, birds, mammals, and humans (ATSDR 1995).

PCBs are absorbed after oral, inhalation, or dermal exposure and are stored in adipose tissue. The location of the chlorine atoms on the phenyl rings is an important factor in PCB metabolism and excretion. The major route of PCB excretion is in the urine and feces; however, more important is the elimination in human milk. Metabolites are predominately found in urine and bile, while small amounts of the parent compound are found in the feces. Biliary excretion appears to be the source of fecal excretion (ATSDR 1995).

Accidental human poisonings and data from occupational exposure to PCBs suggest initial dermal and mucosal disturbances followed by systemic effects that may manifest themselves several years post-exposure. Initial effects are enlargement and hypersecretion of the Meibomian gland of the eye, swelling of the eyelids, pigmentation of the fingernails and mucous membranes, fatigue, and nausea. These effects were followed by hyperkeratosis, darkening of the skin, acneform eruptions, edema of the arms and legs, neurological symptoms, such as headache and limb numbness, and liver disturbance (USAF 1989).

Hepatotoxicity is a prominent effect of Aroclor® 1254 that has been well characterized (EPA 1995a).

Effects included hepatic microsomal enzyme induction, increased serum levels of liver-related enzymes indicative of hepatocellular damage, liver enlargement, lipid deposition, fibrosis, and necrosis. The evidence of liver involvement including asymptomatic hepatomegaly and/or elevated serum SGTP, SGOT, or SGPT, has been found for several of the PCB compounds.

EPA Guidelines set the standard for exposure to Polychlorinated Biphenyls Compounds (PCBs) as follows:

Polychlorinated Biphenyls Compounds	**=**	**50 parts per million (ppm) for all compounds combined**

2.0 METHODOLOGY

This report documents the inspection and sampling for the presence of suspected Polychlorinated Biphenyls Compounds in paint which could affect the repair/renovation of the doors of the Vehicle Assembly Building, Kennedy Space Center, Florida. The survey and sampling were conducted by V. Douglas Browning of BEST on April 25, 2005. The inspection included all of the areas scheduled to be affected by the repairs/renovation of the facility doors.

The inspector performed the survey moving in a systematic fashion and sampled each identified homogeneous area. A critical step in this process was the delineation of different suspect homogeneous areas of the various materials and the definition of these homogeneous areas for specific sampling of each type of suspect paint to ascertain if any heavy metals are present in the homogeneous areas identified. The delineation of these homogeneous areas formed the basis upon which subsequent steps of the inspection were completed.

In general, homogeneous areas were defined as "those areas of the facility containing a given type of suspect material or paint that is uniform in color and texture." This approach involved notation of the location of each homogeneous area of suspect material and paint by using a coding system to delineate different colors and textures of suspect materials. The designation of each suspect PCB in paint homogeneous area was defined based upon the area containing the same type of material and/or color and texture of paint, (as determined by physical appearance, age, and general condition) it was then considered to be one homogeneous area.

Once homogeneous areas were defined, a sampling strategy was developed for each to provide random samples of suspect HM paint. The suspect HM paint chip samples from each homogeneous area were analyzed using the appropriate analytical method for each type of sample by a laboratory that is accredited by AIHA.

Sample locations using a unique identifying number were noted on the Field Survey Log Sheet and Chain-of-Custody Form. The Field Survey Log Sheet and Chain-of-Custody Forms accompanied the samples to the laboratory, after being signed by the sampler. At the laboratory the analyst receiving the samples then signs for the samples.

During the inspection some of the physical parameters documented by the surveyor for the suspect PCBs in paint were:

- **Condition of material;**
- **Amount of exposed surface area of material;**
- **Activity, movement, or vibrational effects within the area;**
- **Signs of past disturbance.**
- **Accessibility of material to building occupants; and**
- **Potential for disturbance.**

Using the above parameters, along with the results of the suspect HM paint samples, a risk assessment was conducted. The current EPA guidelines limit the PCBs allowed in any compound to 50 ppm, by weight (50 ug/Kg), so during this risk assessment any sample containing lead at or above the EPA limit is considered as a PCB. The larger the ppm the higher the PCBs in the paint, thus the more probability of a problem with the PCBs in paint, unless proper precautions are taken.

3.0 DISCUSSION OF FINDINGS AND RECOMMENDATIONS

Table 3-1, shows the location of all suspect PCBs in paint samples taken and the associated homogeneous areas. Only the paint chip samples containing PCBs equal or more than the preceding guidelines were considered as PCBs in paint. For this reason the findings do not discuss the homogeneous areas of paint that were sampled but found to contain less than the guidelines.

3.1 Sampled Suspect PCBs in paint

There were four different HA's of suspect PCBs in paint sampled, from the inside of the VAB doors and frames which are to be repaired/renovated/upgraded.

3.1.1 Gray Semi-gloss Paint on exterior steel support; GSG-1

The sample taken of HA, GSG-1, Gray semi-gloss multi-layered suspect PCB paint chips from the steel supporting beams of the south transfer isle door, was analyzed and confirmed to be that six of the Aroclor compounds of PCB were not detected. The compound Aroclor 1254; however was detected at the 3.6 parts per million (ppm) level but this is significantly below the EPA regulatory threshold of 50 ppm.

3.1.2 Gray Semi-gloss Paint on exterior steel support; GSG-2

The sample taken of HA, GSG-2, Gray semi-gloss multi-layered suspect PCB paint chips from the steel supporting beams of the south high bay #2 door 9R, was analyzed and confirmed to be non-PCB containing paint without any of the seven Aroclor compounds being detected.

3.1.3 Gray Semi-gloss Paint on exterior steel support; GSG-3

The sample taken of HA, GSG-3, Gray semi-gloss multi-layered suspect PCB paint chips from the steel supporting beams of the south high bay #4 door 9R, was analyzed and confirmed to be that five of the Aroclor compounds of PCB were not detected. However the compounds: Aroclor 1254 was detected at the 2.3 parts per million (ppm) level and Aroclor 1260 was detected at the 1.1 parts per million (ppm) but these when combined are significantly below the EPA regulatory threshold of 50 ppm.

3.1.4 Gray Semi-gloss Paint on exterior steel support; GSG-4

The sample taken of HA, GSG-4, Gray semi-gloss multi-layered suspect PCB paint chips from the steel supporting beams of the north end of the transfer isle translucent panel supports, was analyzed and confirmed to be non-PCB containing paint without any of the seven Aroclor compounds being detected.

3.2 Recommendations

3.2.1 Polychlorinated Biphenyls Compounds in paint

There was two HA of suspect PCBs in paint identified that were confirmed to contain one or more PCB compounds but all were below the threshold levels for allowable PCBs content. Since this paint had been found as positive for lead the work that is to be done in this ares must take that into account. It is recommended that the proper precaution is to require all areas that will require the paint to be cut, ground, abraded or drilled to have the paint removed using LBP abatement techniques to remove the paint from the areas to be disturbed during the repair/renovation/upgrade of the doors. this wil also minimize any exposure to the small amounts of PCBs found.

BROWNING ENVIRONMENTAL SERVICE TECHNOLOGIES

PCBs in PAINT CHIP SURVEY AND ASSESSMENT FORM

BEST PROJ. No.: 504-007 ***Field Group I.D.:*** P504KSCVABS*
Inspector (s): DOUG BROWNING
Building: Vehicle Assembly Building, Doors
Laboratory: **EMSL, ANALYTICAL, INC**
Lab Contact Person: Jason McDonald, (407) 375-9573

Building Owner: NATIONAL AERONAUTICS and SPACE ADMINISTRATION
Building Contact Person: Darold Cole, RS&H (321) 453-0223
Consultant: V. Douglas Browning (352) 258-6284

BROWNING ENVIRONMENTAL SERVICE TECHNOLOGIES, 1709 NE 40th, PLACE, GAINESVILLE, FL 32609
BEST PHONE: (352)372-4067 FAX No. (352) 335-4304

SAMPLE NO.	SAMPLING DATE	LOCATION OF SAMPLE (INTERIOR, EXTERIOR, SURFACE) AND SUBSTRATE MATERIAL	PEELING BUBBLES (Y-N)	G - GOOD F - FAIR, P - POOR CONDITION	(H, M, L) DAMAGE POTENTIAL	AREA OF SAMPLE (SQUARE CM)	AROCLOR - 1016 RESULTS ppm	ug/Kg	AROCLOR - 1221 RESULTS ppm	ug/Kg	AROCLOR - 1232 RESULTS ppm	ug/Kg	AROCLOR - 1242 RESULTS ppm	ug/Kg	AROCLOR - 1248 RESULTS ppm	ug/Kg	AROCLOR - 1254 RESULTS ppm	ug/Kg	AROCLOR - 1260 RESULTS ppm	ug/Kg	TOTAL PCBs RESULTS ppm	ug/Kg
* 1	25-Apr-05	Int. Steel, STID, GSG-1	Y	F	L	10.0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0
* 2	25-Apr-05	Int. Steel, SHB2, D9R, GSG-2	Y	F	L	10.0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	3.6	3600	0.0	0	3.6	3600.0
* 3	25-Apr-05	Int. Steel, SHB4, D9R, GSG-3	Y	F	L	10.0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	2.3	2300	1.1	1100	3.4	3400.0
* 4	25-Apr-05	Int. Steel, STITPS, GSG-4	Y	F	L	10.0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0						

TABLE 3 - 1

Appendix A

Personnel Certifications

Appendix B

Laboratory Analysis Data Sheets

1D

PCB ANALYSIS DATA SHEET

CLIENT SAMPLE ID.

/

Lab Name: EMSL ANALYTICAL Contract:

Lab Code: Case No.: SAS No.: SDG No.:

Matrix: (soil/water) Solid Lab Sample ID: 1622-1

Sample wt/vol: 2.00 (g/mL) g Lab File ID: H1593

% Moisture: N/A decanted: (Y/N) N Date Received:

Extraction: (SepF/Cont/Sonc) Sonc Date Extracted: 05/06/05

Concentrated Extract Volume: 10 (ml) Date Analyzed: 05/10/05

Injection Volume: 1 (uL) Dilution Factor: 1

GPC Cleanup: (Y/N) N pH: Sulfur Cleanup: (Y/N) Y

H_2SO_4 Cleanup: (Y/N) Y

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
12674-11-2	Aroclor-1016	500	U
11104-28-2	Aroclor-1221	500	U
11141-16-5	Aroclor-1232	500	U
53469-21-9	Aroclor-1242	500	U
12672-29-6	Aroclor-1248	500	U
11097-69-1	Aroclor-1254	3600	
11096-82-5	Aroclor-1260	500	U

N/A = Not Applicable

U= Not detected

*Sample Results are not Corrected for Total Solids

FORM I PEST

PCB

3/90

1D
PCB ANALYSIS DATA SHEET

CLIENT SAMPLE ID.

2

Lab Name: EMSL ANALYTICAL Contract:

Lab Code: Case No.: SAS No.: SDG No.:

Matrix: (soil/water) Solid Lab Sample ID: 1622-2

Sample wt/vol: 2.10 (g/mL) g Lab File ID: H1594

% Moisture: N/A decanted: (Y/N) N Date Received:

Extraction: (SepF/Cont/Sonc) Sonc Date Extracted: 05/05/05

Concentrated Extract Volume: 10 (ml) Date Analyzed: 05/10/05

Injection Volume: 1 (uL) Dilution Factor: 1

GPC Cleanup: (Y/N) N pH: Sulfur Cleanup: (Y/N) Y

H_2SO_4 Cleanup: (Y/N) Y

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
12674-11-2	Aroclor-1016	480	U
11104-28-2	Aroclor-1221	480	U
11141-16-5	Aroclor-1232	480	U
53469-21-9	Aroclor-1242	480	U
12672-29-6	Aroclor-1248	480	U
11097-69-1	Aroclor-1254	480	U
11096-82-5	Aroclor-1260	480	U

N/A = Not Applicable
U= Not detected

*Sample Results are not Corrected for Total Solids

FORM I PEST
PCB

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1D
PCB ANALYSIS DATA SHEET

CLIENT SAMPLE ID.

3

Lab Name: EMSL ANALYTICAL Contract:

Lab Code: Case No.: SAS No.: SDG No.:

Matrix: (soil/water) Solid Lab Sample ID: 1622-3

Sample wt/vol: 2.04 (g/mL) g Lab File ID: H1595

% Moisture: N/A decanted: (Y/N) N Date Received:

Extraction: (SepF/Cont/Sonc) Sonc Date Extracted: 05/05/05

Concentrated Extract Volume: 10 (ml) Date Analyzed: 05/10/05

Injection Volume: 1 (uL) Dilution Factor: 1

GPC Cleanup: (Y/N) N pH: Sulfur Cleanup: (Y/N) Y

H_2SO_4 Cleanup: (Y/N) Y

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
12674-11-2	Aroclor-1016	490	U
11104-28-2	Aroclor-1221	490	U
11141-16-5	Aroclor-1232	490	U
53469-21-9	Aroclor-1242	490	U
12672-29-6	Aroclor-1248	490	U
11097-69-1	Aroclor-1254	2300	
11096-82-5	Aroclor-1260	1100	

N/A = Not Applicable
U= Not detected

*Sample Results are not Corrected for Total Solids
Note: Aroclor results may be biased high due to pattern overlap

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PCB

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1D
PCB ANALYSIS DATA SHEET

CLIENT SAMPLE ID.: 4

Lab Name: EMSL ANALYTICAL Contract:

Lab Code: Case No.: SAS No.: SDG No.:

Matrix: (soil/water) Solid Lab Sample ID: 1622-4

Sample wt/vol: 2.02 (g/mL) g Lab File ID: H1596

% Moisture: N/A decanted: (Y/N) N Date Received:

Extraction: (SepF/Cont/Sonc) Sonc Date Extracted: 05/05/05

Concentrated Extract Volume: 10 (ml) Date Analyzed: 05/10/05

Injection Volume: 1 (uL) Dilution Factor: 1

GPC Cleanup: (Y/N) N pH: Sulfur Cleanup: (Y/N) Y

H_2SO_4 Cleanup: (Y/N) Y

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ug/Kg	Q
12674-11-2	Aroclor-1016	500	U
11104-28-2	Aroclor-1221	500	U
11141-16-5	Aroclor-1232	500	U
53469-21-9	Aroclor-1242	500	U
12672-29-6	Aroclor-1248	500	U
11097-69-1	Aroclor-1254	500	U
11096-82-5	Aroclor-1260	500	U

N/A = Not Applicable
U= Not detected

*Sample Results are not Corrected for Total Solids

FORM I PEST
PCB

3/90